SPRING STRUT WITH A HEIGHT-ADJUSTABLE SPRING COLLAR

SPECIFICATION

The invention pertains to a spring strut with a height-adjustable spring collar according to the introductory clause of Claim 1.

A spring strut with a detachable spring collar is known from DE 85 10 058 U1, where the spring collar is supported in a retaining ring. The retaining ring for its own part can be attached independently of the spring collar to the cylinder of the spring strut, together with which it can be coated as a separate structural component. The height of the spring collar is determined by the retaining ring and cannot be changed.

DE 198 51 019 C1 discloses a spring strut with a cylinder, which carries a retaining ring for a spring collar; the height of the collar can be adjusted as desired and then held permanently in position there. The retaining ring is provided with at least one groove, into which at least one circumferential area of a sleeve section of the spring collar can be radially deformed. The degree to which the sleeve section overlaps the groove determines the maximum extent to which the height of the spring collar can be adjusted.

A spring assembly for motor vehicles is also known from DE 197 44 757 A1. In this case, the height of the spring collar can be actively changed by the use of a hydraulic medium. A spring assembly of this type is intended especially for vehicles of the luxury class, in which it must be anticipated that a system for automatically controlling the level of the vehicle body will require the relatively frequent adjustment of the height of the spring collar.

The task of the present invention is to create a spring strut with a height-adjustable spring collar, where particular emphasis is placed on the long-term reliability of the unit.

The task is accomplished according to the invention in that, on the cylinder side, a chamber is provided, which is at least partially filled with a curable material, where the sleeve section is in contact with the curable material, which, when in the solid state, transmits a supporting force from the cylinder to the spring collar, and where the chamber has at least one isolating sleeve with a radial guide surface, by which the sleeve is in contact with the sleeve section of the spring collar.

The curable material can be a plastic material, but metallic materials can also be used. When the height of the spring collar is to be set, it is held in its predetermined position, and an appropriate amount of the curable material is injected into the chamber.

To increase the long-term reliability of the unit, the isolating sleeve prevents the sleeve section from coming into frictional contact with the walls of the chamber during assembly; under certain conditions, such frictional contact could damage a protective surface coating of sealing material.

Under consideration of cost and assembly effort, the isolating sleeve should consist of a plastic material. It is effective to use a material for the isolating sleeve that can form a bond with the curable material inside the chamber. In addition, the surface of a plastic is softer than that of a metallic material and will thus leave correspondingly fewer marks on the surface of the cylinder.

It is possible for the chamber on the cylinder side to be formed by a support ring, which is permanently connected axially to the cylinder.

In another advantageous elaboration, the support ring has a sleeve and a bottom part, and the sleeve section is at held at least partially inside the sleeve of the support ring.

To ensure ease of access in a device of this type, the support ring has a connecting opening for the curable material.

In a preferred variant, the isolating sleeve is located between the sleeve of the support ring and the sleeve section of the spring collar. The chamber should have the smallest possible gaps between the guide sleeve and the sleeve parts defining the chamber. If the cylinder of the spring strut defines the chamber for the curable material, the sleeve section of the spring collar would have to be designed to fit snugly around the cylinder, which means that, during assembly, abrasive contact could occur between the sleeve section and the cylinder. Simply because an isolating sleeve located between the sleeve section and the cylinder would be shorter that the cylinder, the process of threading onto the isolating sleeve becomes easier, and it is thus also possible to avoid damage to the surface because of the distance from the cylinder.

Alternatively or in addition, the isolating sleeve could also be located between the cylinder and the sleeve section of the spring collar.

The isolating sleeve can also form a part of the chamber. The design of the support ring would thus become much simpler.

It is also possible for the isolating sleeve to form the bottom part of the support ring.

Finally, a first isolating sleeve can engage with the outside diameter of the sleeve section of the spring collar, and a second isolating sleeve can engage with the inside

diameter, these two sleeves being connected to each other by the bottom part. The support ring would thus be formed in its entirety by the isolating sleeve, or, equivalently, the support ring would thus form the isolating sleeve.

It is often a requirement that it be possible to install the spring collar at an angle to the cylinder, so that the elastic forces that act on the spring strut can be compensated. For this purpose, the guide surface of the isolating sleeve for the sleeve section of the spring collar is designed to be at a certain angle to the longitudinal axis of the spring strut.

According to an advantageous subclaim, a fastening ring is connected nonrotatably to the container and to the isolating sleeve after the isolating sleeve has arrived in its final position. This is intended to ensure that the support ring and thus the spring collar, as a result of an elastic force acting on the spring collar, no rotational movement of the isolating sleeve with respect to the container occurs.

The invention will be described in greater detail on the basis of the following description of the figures.

Figure 1 shows part of a spring strut with at least one isolating sleeve;

Figure 2 shows an isolating sleeve with a bottom part; and

Figure 3 shows an isolating sleeve, which forms the entire support ring, in a slanted position.

Figure 1 shows only a part of a cylinder 1, which carries a spring collar 3. The cylinder can be part of a vibration damper or of a pneumatic spring. An axially movable piston or a coaxial pressure tube, which contains a working medium, can be provided inside the cylinder.

A support ring 5 is fastened on the cylinder side for which various types of fastening means could be used. In this case, a lock washer 7 is shown in the drawing, but a weld could also be used. The support ring 5 consists of a bottom part 9 and a sleeve 11, so that the support ring and the cylinder cooperate to form a ring-shaped chamber 13. The bottom end of a sleeve section 15 of the spring collar 3 fits into this chamber, in which it can slide in the axial direction. On the cylinder 1, as shown on the left half of the cross section, an isolating sleeve 16 is provided, which has a guide surface 18 for the sleeve section. The isolating sleeve is made of plastic, for example, and is provided with a soft surface, so that it will not leave any abrasion marks on the guide sleeve or on the cylinder. Alternatively or in combination, the isolating sleeve can also be installed between the sleeve 11 of the support ring and the sleeve section of the support ring 5, as shown on the right half of the cross sectional drawing. If only one isolating sleeve is present between the support ring and the sleeve section, then it is advisable to increase the size of the gap between the sleeve section of the spring collar and the cylinder, so that there will not be any abrasive contact between the spring collar and the cylinder when the spring collar is installed. Through a connecting opening 17 in the support ring, the chamber 13 can be filled with a curable material at least up as far as the lower end surface 19 of the sleeve section 15. A liquid plastic can be used as the curable material, or possibly a hardenable metallic material could be used.

If the cylinder 1 is a component of a vibration damper, then a retaining device (not shown) will be set onto the spring collar 3 at the end of the vehicle assembly process, for example, in order to align the vehicle in the horizontal direction. As this is being done, the sleeve section of the spring collar will shift position inside the chamber. After

the desired height adjustment has been made, the chamber will be filled with the curable material at least up as far as the bottom end surface 19 of the sleeve section. As soon as the curable material has hardened sufficiently, the retaining device can be removed, and the vehicle will be horizontal regardless of the equipment with which it has been loaded.

In Figure 2, the bottom part 9 of the support ring 5 is also formed by the isolating sleeve 16. Essential parts of the chamber 13 are thus defined by the isolating sleeve. The sleeve 11 represents a separate component of the support ring. A fastening ring 21 supports the bottom part 9 on the cylinder. The fastening ring 21 could, again, be welded to the cylinder. By virtue of the sleeve 16 having a central bore which is offset from the surface 18, the sleeve section 3, whose center line is shown on the left, is arranged eccentrically with respect to the cylinder 1.

Another developmental stage is shown in Figure 3, according to which design a first isolating sleeve 16a engages with the outside diameter of the sleeve section 15 of the spring collar 3, and second isolating sleeve 16b engages with the inside diameter, the two sleeves being connected to each other by the bottom part 9. Thus the support ring 5 is formed in its entirety by the two isolating sleeves 16a, 16b.

The guide surface 18 of the isolating sleeve for the sleeve section 15 of the spring collar, furthermore, is designed so that it is at an angle to the longitudinal axis of the spring strut 1 in order to compensate for transverse forces acting on the spring strut. It is also possible for a fastening ring 21 to be connected nonrotatably to the cylinder and to the isolating sleeve in the final stage of assembly, so that again, by means of welds, for example, the spring collar can be prevented from rotating with respect to the cylinder.